Claim 1

<<<... a control system including a plurality of electrical components that receives the electrical energy and dynamically electronically adjusts the level of an output electrical energy to the object between multiple, discrete electrical energy levels without changing the electrical components. ...>>>

In addition, the overall drag level can be set via user control so that a weaker person can select a lighter setting than a very strong person. In this fashion, drag levels can span a typical range of 200 to 500 percent from minimum to maximum level. P3-L24

. This torque versus speed relationship can be completely specified with the electronics as described below. P3-L29

Figure 3B is a block diagram of a switching converter having features of the present invention P5-L6

Figure 3I is a graph that illustrates a variety of possible duty cycle versus rotor/crank arm speed curves P5-L18

Depending upon the embodiment, the control system 24 can perform one or more of the features of (i) adjusting the torque experienced by the user during rotation of the crank assembly 14, (ii) automatic detection of the load voltage required to charge the electronic device 11, (iii) allow for the hookup of multiple power sources 10 to charge the electronic device 11, and/or (iv) detect and configure to charge various custom battery types. P11-L26

For example, the user input 84 allows the user to specify the required charging conditions and termination conditions by specifying particular voltages, output power, etc., or by selecting among several previously defined battery types or electronic devices (ex: cellphone types). Further, the user input 82 can allow the user to adjust desired crank torque drag up or down for the convenience of the individual user. P12-L12

The control board 84 acts as the central component of the power source 10, coordinating all monitoring, control, and status display functions. Further, the control board 84 can perform the functions of the control system 24 described above. In one embodiment, the control board 84 firstly accepts the input from the user with the user input 82 specifying the target battery charging requirements of voltage and current, and termination conditions of voltage, NDV or temperature for the electronic device 11. This feature allows the power source 10 to accommodate many different voltages, currents, etc. of the many types of battery chemistries. Additionally, commands such as desired crank drag are specified here. The functions of the control board 84 are described in more detail below. P12 L23

Figure 3I illustrates a variety of possible duty cycle versus rotor/crank arm speed curves.

In one embodiment, a constant duty cycle could be implemented. This is illustrated as straight line 357 in Figure 3I. With a single-stage flyback converter, this would result in a crank torque that gets harder as the crank arm is turned faster. The user could select a different similar duty cycle curve. This is illustrated as straight line 359 in Figure 3I. In this case, a similar profile of the crank torque which gets harder at higher speeds would be obtained. But the overall levels at all speeds would be harder. This is similar to selecting a higher bicycle gear ratio. The curved profile 361 of Figure 3I illustrate that any shape curve can be implemented offering better ergonomics than a single constant duty cycle. In a similar fashion, another similar curve 363 could be user-selected offering a higher overall level of effort. It is to be understood that more than just 2 curves per! family could be easily implemented and selected by the user. P17-L11

PWM dynamic modulation circuit description P18-L3 to P19-L6

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claim 19

<<<...a control system that receives the electrical energy, the control system including a processor, a first regulator the controls the level of an output electrical energy to the object, and a second regulator that diverts at least a portion of the electrical energy and regulates the electrical energy to the processor ...>>>

As cranking is initiated and voltage is produced, the microprocessor comes alive and executes a sequence of steps P19-L2

In one embodiment, the control board must have power to begin operation, although the required power is very low. The circuits on the control board have features that can produce sufficient voltage to charge a cap or supercap from a power off state with only human cranking and no cpu help. P22-L10

2nd & 3rd regulators fig3c, fig3db